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(54) Title: FIBRE OPTIC LAMPS

(57) Abstract: A lamp comprising an integral rod or tube like member comprising a light generating source (12, 120) located in a volume (13) at or near one end of the member and a cane extending to a light output face (16) at the other end of the member to the one end by means of which light originating from the light generating source (12, 120) is emitted from the lamp (11).

## FIBRE OPTIC LAMPS

### TECHNICAL FIELD

This invention relates to fibre optic lamps.

### BACKGROUND ART

In our co-pending applications UK 96 08381.0, 97 04423.4 and 97 06862.1 and International Application PCT/GB97/01121 and applications based thereon there are variously described lamps suitable for use including use in relation to fibre optic devices.

Further developments have now been undertaken which have led to a number of lamp design developments which are briefly described hereafter.

### DISCLOSURE OF INVENTION

According to the present invention there is provided a lamp (11) comprising an integral rod or tube like member comprising a light generating source (12, 120) located in a volume at or near one end of the member and a cane (15) extending to a light output face (16) at the other end of the member to the one end by means of which light originating from the light generating source (12, 120) is emitted from the lamp (11).

According to a first preferred version of the present invention the light generating source (12, 120) is an electrical filament which is rendered incandescent or an electric discharge or arc or a semiconductor.

According to a second preferred version of the present invention or of the first preferred version thereof the lamp (11) includes reflective means such as a coated surface (17, B, L, 16A) incorporated in the lamp (11) and serving to direct light

emitted from the light generating source towards the light output face (16). Typically the coated surface (17, B, L, 15A) can be a surface forming part of the body of the lamp (11) or a surface of a member incorporated in the lamp during fabrication.

According to a third preferred version of the present invention or of any preceding preferred version thereof the lamp (11) included refractive means such as a lens or coated surface incorporated in the lamp and serving to deflect light emitted from the light generating source towards the light output face (16).

#### BRIEF DESCRIPTION OF DRAWINGS

Exemplary embodiments of the invention will now be described with reference to the drawings Figures 1 to 18 of lamps. Figures 1 - 14 and 16 - 18 each comprise a set of three drawings of a given embodiment of which each set is made up of:

- a first (A) drawing in the form of a longitudinal side view,
- a second (B) drawing in the form of a longitudinal plan view; and
- a third (C) drawing showing a filament or other light emitting source, as viewed through from the right hand end of the lamp as shown in drawing (B);

Figure 15 comprises a set of two drawings corresponding to drawings (A) and (B) of the remaining figures.

#### MODES FOR CARRYING OUT THE INVENTION

Generally the figures show a lamp in the form of an integral rod with an enclosed volume (13) near one end containing a light generating source (12) fed by electrodes entering the volume by way of conventional glass/metal seals. From the volume (13) light extends through a cane (15) forming the remainder of the rod to an end, remote from the one end, from which the light passes out of the lamp.

Figure 1 shows a lamp 11 having a filament 12 located in a volume 13 towards the end 14 of the lamp 11 to provide for the largest possible light flux to pass into and

through quartz cane 15 to light output face 16. The lamp 11 can be coated with an internal or external reflective layer to enhance the light passing to the output face 16.

Figure 2 shows a lamp 11 with filament 12 located at the focus of curved end 17 of volume 13 so as to straighten the rays of light from the filament 12.

Figure 3 shows a lamp 11 with filament 12 located at the front end of volume 13. The volume 13 is of shorter length than in the earlier embodiments to ensure the filament 12 is near the output face 16. To provide for straighter rays and maximum light flux.

Figure 4 shows a lamp 11 with a quartz cane 15 whose end 18 remote from volume 13 is provided with a lenticular end so as to focus light rays. Other end forms can be used to provide for divergence. The shaping can be convex, as shown, concave or Fresnel and be applied just to end 18 or to inner end 19 or to both ends.

Figure 5 shows a lamp 11 having an axial filament 12 and pinch sealed with shaped jaws to press a portion of the side of the lamp 11 and with the aid of internal gas pressure applied in volume 13 produce an axis symmetric parabolic reflector 17 for optimum control of the light rays.

Figure 6 shows a lamp 11 containing a reflective device 17A (shown shaded) which can be of glass, ceramic or other material which is reflective or can be polished and which may also be coated with a single or composite material such as a diachronic coating so as to efficiently direct a beam of light into quartz cane 15.

Figure 7 shows a lamp 11 with areas L, M shown as dashed lines which can be provided with internal or external coatings of solid or diachronic material in order to control light flux of certain frequencies emitted from the lamp 11. Such coatings can be used to control heat flux around the lamp 11, anti-reflection coatings to improve

the optical efficiency of the lamp or filtering means selected to direct a beam of visible, various colours, infra-red or ultra-violet light beams.

Figure 8 shows a lamp 11 with filament 12 and having a quartz cane 15 having a covering 15A of a material of a different refractive index intended to give rise to a leakage of a small amount of light from the cane and result in a side-emitting lamp. The coating 15A can be applied over all or some of the outside surface 15B of the cane 15. The strip coatings can be used for applications such as edge lighting of signs. A similar effect may be achieved by etching the surface 15B of the cane 15. There may be a reflective or other coating applied to the end of the cane 15 or a second light source.

Figure 9 shows a lamp 11 with a mitred end 16 to cane 15 to redirect a beam of light generated by filament 12 at an angle. The mitred end 16 can be coated or otherwise treated to improve the efficacy of the system.

Figure 10 shows a lamp 11 with a flared cane 15 to straighten light from filament 12. The flared sides are in this case shown straight but they could be curved.

Figure 11 shows lamp 11 with a constricted cane 15 for a small emission area 16. As with the embodiment of Figure 10 the flared sides here shown straight could be curved.

Figure 12 shows a lamp 11 with a cane 15 of waisted, or concave, shape. Alternatively a cane could be provided fatter, or convex shape at the centre rather than at the ends.

Figure 13 shows a lamp 11 with a flat incandescent element 12 shown (C) square in shape. It can be circular or a shape formed by any other polygon.

Figure 14 shows a lamp 11 with a stereopticon type filament 12. This may be planar, conical or any other formation, not necessarily circular in section. The filament may be formed from wire or from sheet.

Figure 15 shows a lamp 11 consisting made up into a mirror-condenser system with a rear ellipsoidal section 20 and a front spherical mirror section 21 to provide for only the straightest rays of light to enter the cane 15. Wider angle rays are re-directed by the front section 21 to impinge on the rear section 20 and so be directed to enter the cane as straightened light rays.

Any of the embodiments illustrated in Figures 1-15 can be adapted to have a light source other than an incandescent filament. In the case of a light source in the form of an electric discharge or arc the light source can be sealed inside a secondary outer containment which can be shaped for desired control of the light output. Apart from electric discharge or arc light sources semiconductor light sources can be used such as a P-N junction (Light Emitting Diode), light emitting polymer, fluorescent including luminescent and phosphorescent materials, cathodoluminescent, bioluminescent materials, incandescent arcs, flaming arcs, incandescence of a body induced by electric discharge, electrodeless discharges, molten incandescence sources contained, for example, in an electromagnetic field, or frictional incandescent sources such as may be induced by, for example, microwave irradiation.

Figures 16 - 18 show several embodiments based on electric discharge lamps, some of which consist of an inner discharge vessel contained within an outer jacket. A quartz cane can be sealed to the outer envelope or sealed through this and also to an inner vessel. The outer envelope can enclose vacuum, a gas or a mixture of gases, a liquid or mixture of liquids or a flowing fluid intended, for example, for heat removal or improved optical coupling. The outer jacket and inner vessel can be fabricated substantially from glass, quartz, alumina, sapphire, yttria, other

translucent ceramics, or an opaque metal or ceramic which may be demountable, with a translucent window for light emission.

Figure 16 shows a lamp 11 with an electrical discharge light source 120 replacing the filament 12 of the earlier embodiments. The light source 120 is shown contained in a spherical discharge vessel 120A but other shapes, typically to facilitate manufacture, can be used.

Figure 17 shows a lamp 11 with light source 120 contained within a discharge vessel 121 in turn contained within outer envelope 122 to which quartz cane 15 is sealed.

Figure 18 shows a lamp 11 with a light source 120 contained within discharge vessel 121 in turn contained within outer envelope 122. Envelope 122 has a portion 123 shaped to receive a reflective coating to control light for the beam pattern desired. The reflector portion 123 can be parabolic with the light source 120 mounted at the focus of the parabola. Alternatively the reflector portion can be made ellipsoidal with the source 120 at the first focus and inner end 130 of cane 15 at the second focus.

Figure 19 shows a lamp 11 with a light source 120 contained within discharge vessel 121 in turn contained within outer envelope 122. Cane 15 is of substantially reduced diameter in comparison with outer envelope 122

#### INDUSTRIAL APPLICABILITY

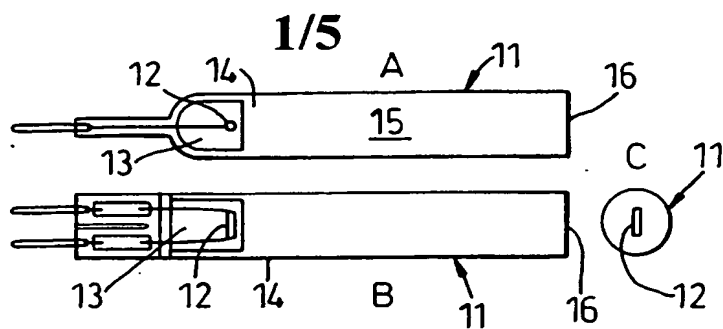
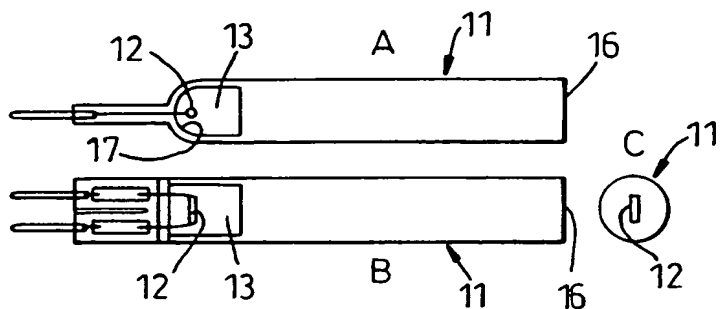
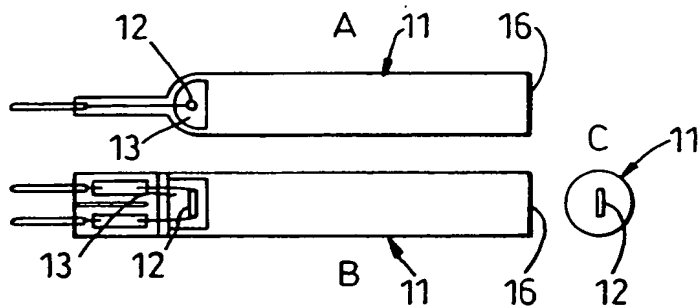
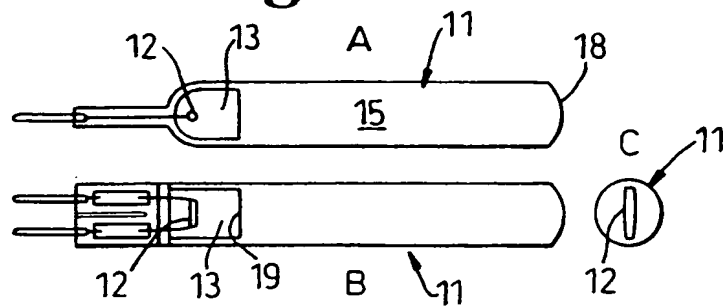
The present invention provides a wide range of lamps for use in a wide range of applications where a source of electromagnetic radiation is required including visible light, infra-red or ultra-violet radiation. Apart from electric discharge or arc light sources semiconductor light sources can be used such as a P-N junction (Light Emitting Diode), light emitting polymer, fluorescent including luminescent and phosphorescent materials, cathodoluminescent, bioluminescent materials, incandescent arcs, flaming arcs, incandescence of a body induced by electric

discharge, electrodeless discharges, molten incandescence sources contained, for example, in an electromagnetic field, or frictional incandescent sources such as may be induced by, for example, microwave irradiation.

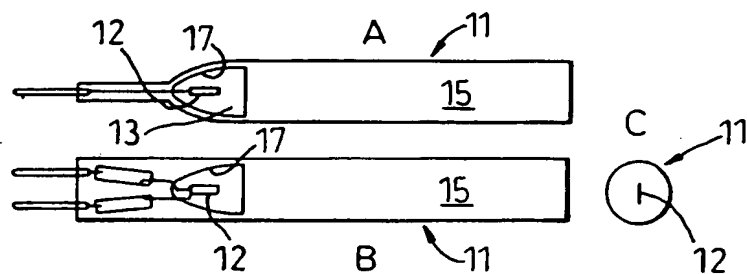


## CLAIMS

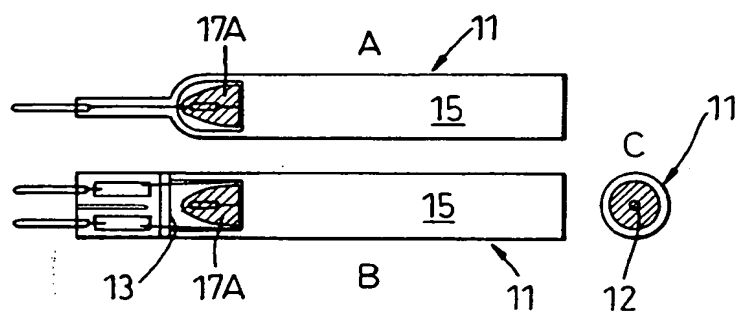
- 1 A lamp (11) comprising an integral rod or tube like member having a light generating source (12, 120) located in a volume (13) at or near one end of the member and a cane (15) extending to a light output face (16) at the other end of the member to the one end by means of which light originating from the light generating source (12, 120) is emitted from the lamp.
- 2 A lamp as claimed in Claim 1 wherein the light generating source (12) is an electrical filament which is rendered incandescent or an electric discharge or arc or a semiconductor.
- 3 A lamp as claimed in Claim 1 or Claim 2 wherein the lamp (11) includes reflective means such as a coated surface (17, B, L, 15A) incorporated in the lamp and serving to direct light emitted from the light generating source (12) towards the light output face (16).
- 4 A lamp as claimed in Claim 3 wherein the coated surface (17, B, L, 15A) is a surface forming part of the body of the lamp or a surface of a member incorporated in the lamp during fabrication.
- 5 A lamp as claimed in any preceding claim wherein the lamp (11) included refractive means such as a lens or coated surface incorporated in the lamp and serving to deflect light emitted from the light generating source towards the light output face (16).
- 6 A lamp as hereinbefore described with reference to, and as illustrated in, any one of Figures 1 to 19 of the accompanying drawings.

**Fig. 1****Fig. 2****Fig. 3****Fig. 4**

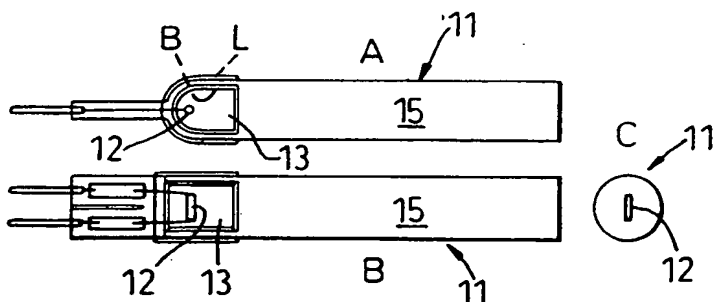
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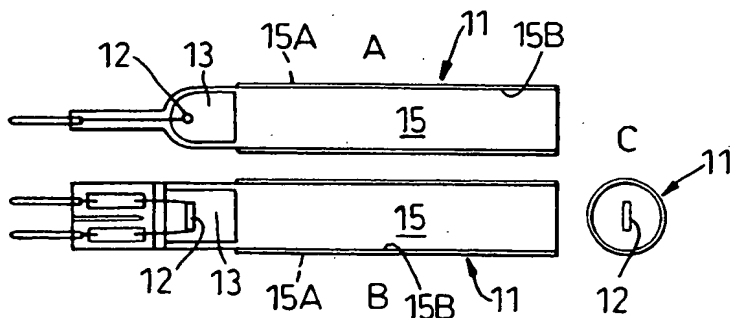
**Fig. 5**



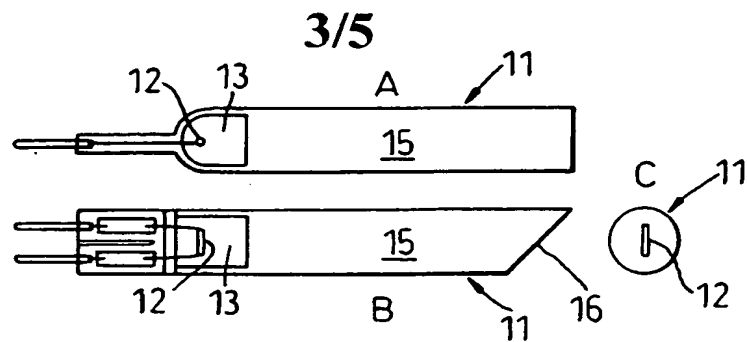
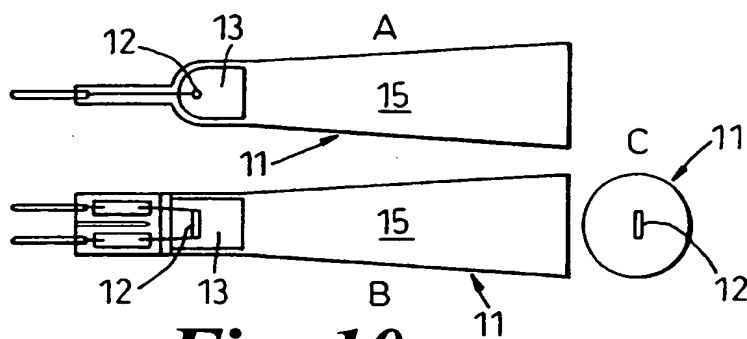
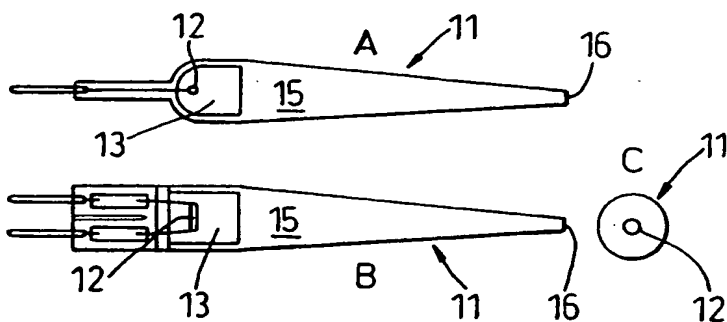
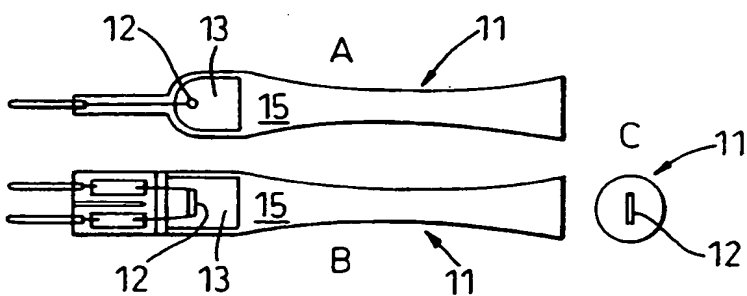
**Fig. 6**



**Fig. 7**

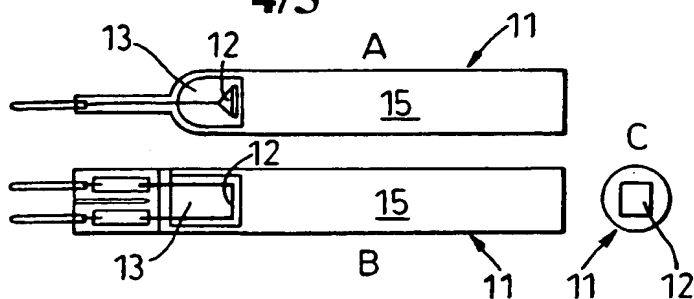


**Fig. 8**

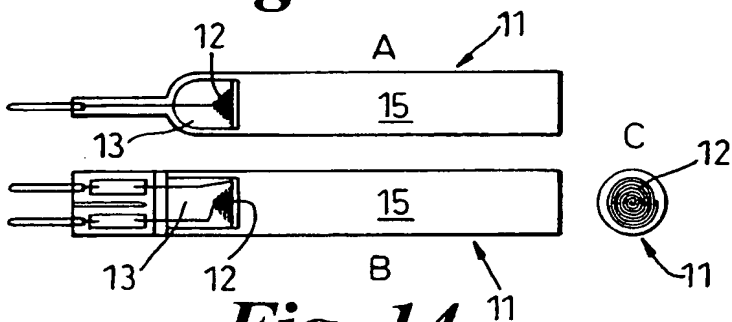
**Fig. 9****Fig. 10****Fig. 11****Fig. 12**

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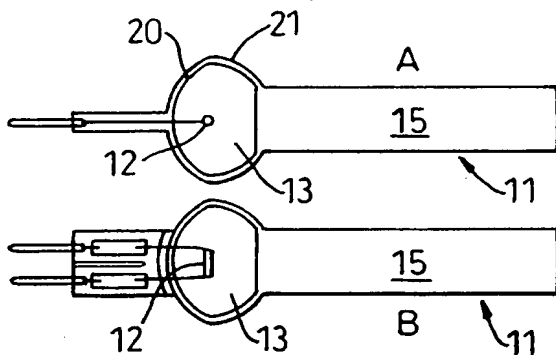
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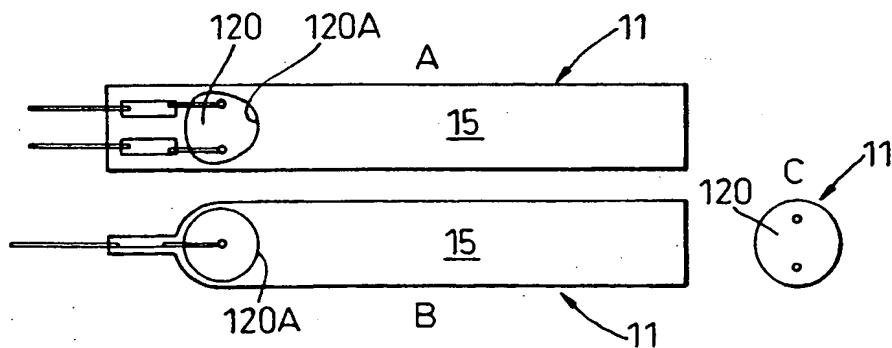
**Fig. 13**



**Fig. 14**

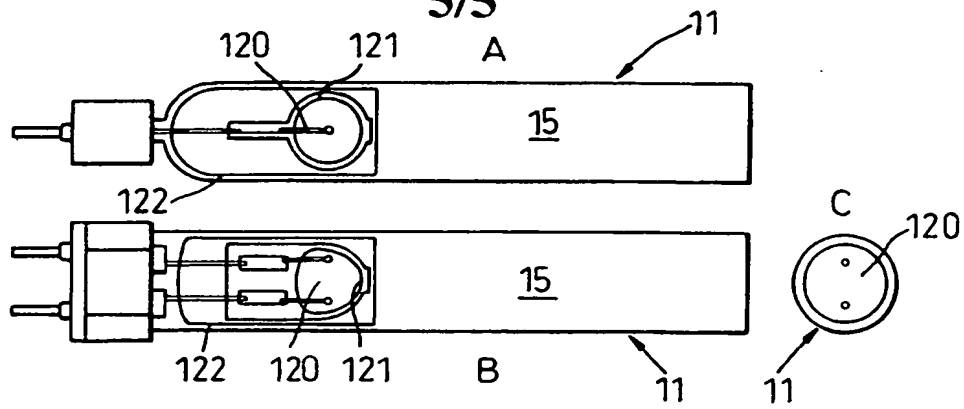


**Fig. 15**

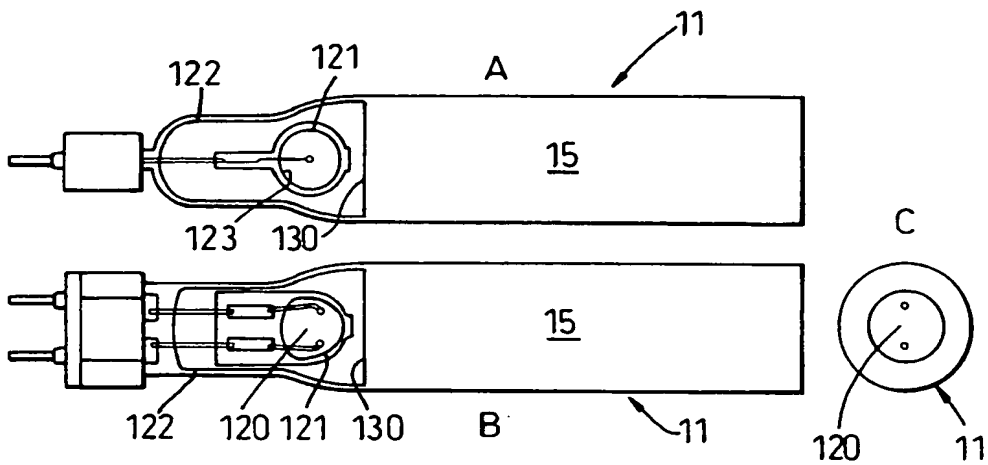


**Fig. 16**

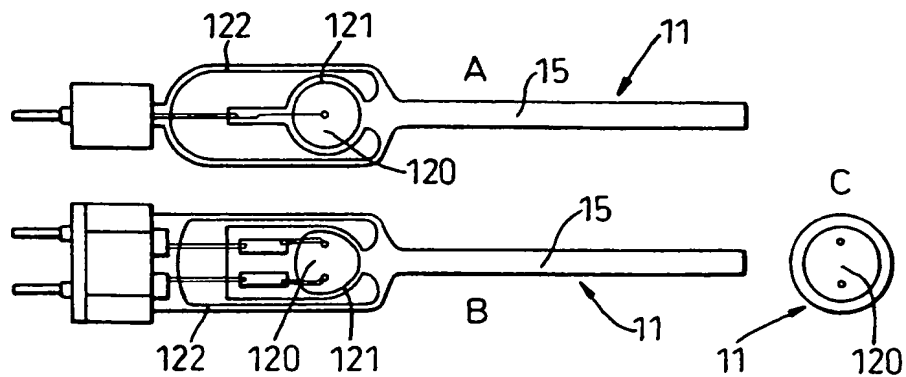
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**Fig. 17**



**Fig. 18**



**Fig. 19**